

# IT2023 ASSIGNMENT 04 (Due Date: Nov 24, 2023)

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**Instructions: You only have to answer all questions. Your answers can be in either Chinese or English.** The following points should be noted.

- If you use a word processing software to edit your answer, please make sure that the file to be submitted is either in WORD or PDF format.
- You need to submit the answer file before the due date to the Gmail account johnsum.nchu@gmail.com.
- Email heading must be conformed to IT2023\_Assignment04\_studentID.
- File name must be conformed to IT2023\_Assignment04\_studentID.
- It is a bonus assignment. If you are too busy to complete the assignment, you can just skip it.

The assessment of this course is solely depended on your work in the course project including your written report and your oral presentation. The scores obtained from the assignments are bounce which are added up on your project score.

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## Question 1

In the lecture, it has been highlighted that *Internet* and *telecommunication network* are two important networks for an information infrastructure.

Specifically, the Internet is a worldwide network of huge number of computer networks. Telecommunication network is a worldwide network of huge number of local telecom networks. In other words, Internet (resp. telecom network) is a *network of networks*.

- (a) Today, a telecommunication network is able to support data and voice services. In the

history, which service came first? Intracity data service came first or intracity voice service?

- (b) In 1900, how were the telegraph (resp. telephone) networks connected? Precisely, how were the telegraph network in UK connected to the telegraph network in France? How were the telegraph network in Beijing connected to the telegraph network in Nanjing?
- (c) How did telegraph service improve administration (resp. management) efficiency of a firm in 1900?
- (d) State five possible ways for connecting two telecommunication networks, say HK Telecom and ChungHua Telecom, in today.
- (e) In the 1990s, Internet was able to support data communication among computers. Today, we are able to talk to each other via LINE or WhatsApp. Still, Internet is a network for data communication. So, how is it possible to do so? [Hint: VoIP is the key technology to support this service.]

## Question 2

Figure 1 shows four hypothetical models for the influence of a father's *love* and *salary* on his interaction with his daughter(s). On the top-left, the factor analysis model has been introduced in the lecture.

As a matter of fact, this factor analysis model is a hypothetical model<sup>1</sup> which consists of eight hypotheses. Clearly, there are many hypothetical models for the investigation of the influence of a father's *love* and *salary* on his interaction with his daughter(s).

- (a) Four hypothetical models are shown in Figure 1. How to determine which model is a

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<sup>1</sup>One can also call it a conceptual model.

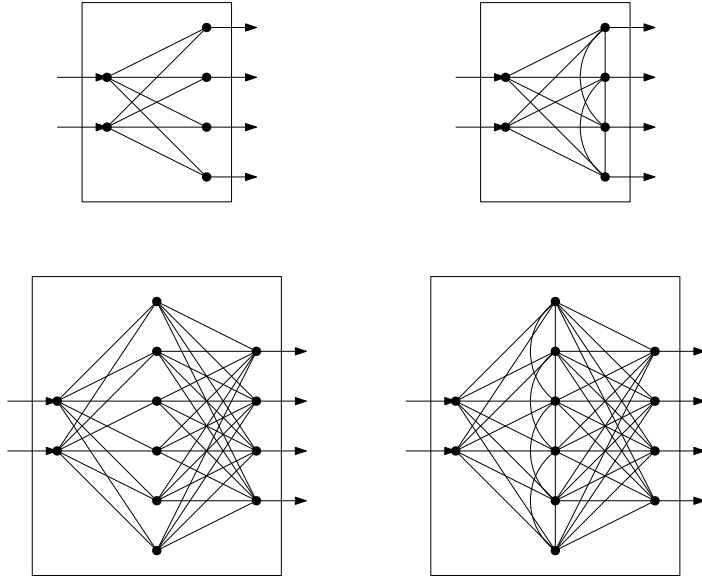


Figure 1: Hypothetical models for the influence of a father’s *love* and *salary* on his interaction with his daughter(s). TL: The factor analysis model. TR: Four outputs are correlated. BL: The inputs *love* and *salary* are not linearly related to the outputs. Instead, they are nonlinearly related to the outputs via six unknown factors. BR: The six unknown factors are correlated.

good model for the influence of a father’s *love* and *salary* on his interaction with his daughter(s)? That is to say, what criteria can be applied to measure the goodness-of-fit of a model?

- (b) For the models as shown in Figure 1, if each connection between two nodes corresponds to a parameter, count the number of parameters in these models<sup>2</sup>.
- (c) How to determine the parameters for a model?

### Question 3

As all AI models have to be practically applicable, the goodness of an AI model becomes a prominent question every AI system developer.

- (a) How do you determine the *goodness* of a financial instrument, like stock and bond, in your investment decision?
- (b) How do you determine if MS Word is a good software for document editing?
- (c) How do you determine if a story is a good story?

- (d) How do you determine if a research paper is a good paper?
- (e) How do you determine if ChatGPT (resp. Google Bard) is a good text generator?

### Question 4

Edge AI has been an on-going research area aiming to bring all AI systems to the edge. Many AI research agencies have been working along this direction, like Hanlab at the MIT and OpenAI.

- (a) Why there is a need on edge AI?
- (b) What is(are) the major problem(s) facing the realization of an edge AI?
- (c) Which Taiwan tech firm offers edge AI solution?
- (d) Which university in Taiwan has conducted edge AI research?

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<sup>2</sup>It should be noted that actual number of parameters in a model is more than the number of connections shown.